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A NATURALIST'S YEAR.

By GRANT ALLEN.

UNDER FALSE COLOURS.

LAST night's frost has wrought great havoc among the few lingering belated summer insects, and combined with the wind and rain of yesterday has completely changed the whole aspect of native life in the country, both as regards the leaves on the deciduous trees and the lesser fauna of the thickets and hedgerows. The brimstone butterflies have retired quietly into the winter quarters, where they will hibernate in a drowsy torpidity till the desired return of spring; the daddy-long-legs flies are still feebly laying the eggs of their leather-jackets grubs among the dying roots of the cabbages or turnips; and a few stray humming-bird hawk-moths, stranded on the cold season, are trying even now to hunt up a head of red clover or a garden jasmine for a last carnival meal of scanty honey. But the insect world as a whole is dead, or at least dormant; and here on the path through the meadow I have seen already half-a-dozen dying bumble-bees—drones or workers, I suppose, for the fertile females retire for their long sleep into the soft moss or trunks of trees—who have fallen victims to the first really hard frost of the present season. Here is another, lying right in my way, cold and stiff—he has only escaped the hungry jaws of his hereditary foes, the harvest mice, to be cut off in the flower of his youth by the relentless fingers of fast-gripping Jack Frost. I will take him up and examine him closely, to see whether I can't find material enough in his poor, cold corpse for a short evolutionary article to be printed in next week's KNOWLEDGE.

Now this is really quite too bad and positively immoral on the part of my ungrateful, frost-bitten bumble-bee. I had got my article half-arranged and comfortably settled in my own mind already, as I carried him along gingerly between finger and thumb to the stile that leads into the Holmdale turnip-field; I was prepared to mourn over him as an idyllic creature that lived honestly, if not by the sweat of his brow, at least by the search after honey on his own account; and now that I have seated myself comfortably on the stile, and begun to examine him carefully with my little pocket lens, I find I was totally and utterly mistaken as to his very identity, and the miserable deceiver has been positively obtaining my sympathy under false pretences. He isn't a bumble-bee at all, as it turns out, but a true two-winged fly—*Volucella bombylans* is his Latin name—carefully tricked in a well-concerted disguise, so as to betray the very bumble-bees themselves into taking him for one of their own community. Well, well! I must console myself under the shock with thinking, not only that far better entomologists than myself have often been deceived at first sight by this treacherous Volucella, but also that the very bees in person can't properly distinguish it from their own legitimate hymenopterous sisters.

After all, the incident really in the end turns out to be a very happy one; for there are bumble-bees everywhere in plenty—like the poor, we have them always with us—but Volucella is an insect you don't come across every day, and it forms, perhaps, the very finest example of that curious biological phenomenon known as *mimicry* to be found anywhere in the British Islands. In actual fact, it is nothing more than a mere fly, belonging to the same great insect group—the Diptera—as the house-fly, the meat-fly, the gnats, the midges, and the mosquitoes, whose chief distinguishing mark it is that in them the hind wings have become reduced to a pair of very small knob-like structures, shaped exactly after the model of the clapper in a bell; but in outer form and colour it approaches so very near to the bumble-bees (which belong to the totally different group of Hymenoptera, including the bees, wasps, ants, and sawflies) that it is almost impossible to distinguish them from one another when on the wing. You have to catch a Volucella and examine it closely in your hands before you begin to perceive the immense number of important structural differences which underlie so close and deceptive an external resemblance. Volucella, in fact, is a fly which has taken to entering the nests of the bumble-bees, and laying its eggs there, side by side with those of the foundress bee who starts the colony. As the bee-larvæ emerge from their eggs, the Volucella larva also simultaneously hatches out, and begins at once to feed upon the helpless grubs of its unwilling hosts. This, of course, is a very disadvantageous practice—from the point of view of the bumble-bees at least; and they would never let Volucella penetrate into their subterranean nests if they could possibly detect and expel her. But, to prevent detection, Volucella has acquired an outer form exactly like that of the unhappy insects on whom her larvæ are parasitic. She is black and very hairy, about the size of a worker bumble-bee; and the colour of the hair is varied on different parts of the body, so as to produce a banded or variegated appearance, after the very fashion of her Hymenopterous victims. Nay, more, to complete the resemblance, she even buzzes exactly like the bees themselves. The consequence is, she can enter the nests of the bumble-bees quite unsuspected, and there lay her eggs in peace and quietness, producing larvæ which will feed hereafter to their hearts' content on the soft, nutritious grubs of the foundress bee.

Now, how did such a quaint resemblance between two totally unrelated and hostile creatures first arise? Mr. Alfred Russell Wallace, who shares with Mr. Darwin the honour of independently originating the fertile theory of Natural Selection, has clearly pointed out the general principle upon which we must explain all such cases of natural mimicry. The resemblance must have been developed by slow stages through the gradual eliminating action of natural selection itself; and in this particular

instance it is the suffering bumble-bees in person who have been the selecting agents to their own ultimate and permanent disadvantage. At first, we must suppose, some adventurous and original-mind flies of the family of Syrphidæ, the greater part of which in their larval condition live upon aphides or plant-lice and other small insects, must have taken tentatively to laying their eggs in the midst of the grubs of bumble-bees or similar hymenopterous species. But the bee would naturally object to this process, if he recognised the intruder as such, and would promptly proceed to sting him to death without further ceremony. Indeed, there is at the present day one parasitic enemy of bees, the little gold-wasp or ruby-tail, which similarly lays its eggs among the burrows of bumble-bees, and rears its larva on the fat young grubs of the rightful occupant; but this little miscreant generally pays its visits to the nest during the absence of the mother bee. If, however, the real owner returns while the gold-wasp is busy laying its eggs, she expels the intruder bodily, tumbling it out by main force, and would no doubt sting it to death, were it not that the gold-wasp is effectually protected by its hard and horny armour-plated suit. Probably the early ancestors of our Volucella did not possess any such external protection as the gold-wasp does, and so most of the flies which ventured into the bees' nests would be promptly detected, and immediately killed. But if there happened to be any which slightly resembled the bumble-bees themselves in form and colour, they might possibly be mistaken at a casual glance by the members of the colony for fellow-workers of the same nest, and so might lay their eggs in peace, leaving an ample progeny to batten on the larvæ of their unsuspecting hosts. The oftener the bees found this trick was played upon them, the warier and wilier would they grow as to the sort of strangers they admitted into the sacred precincts of the nest; and so, after a certain number of generations, they would gradually sting to death all the nascent Volucellas that did not quite come up to their preconceived notions of what a correct and thorough-going bumble-bee ought properly to look like. But in the very act of doing so, they would leave alive those only which approached so nearly to themselves in shape and hue as to be indistinguishable to their simple vision. From generation to generation this weeding-out process would continue unchecked, all the worst imitations being from time to time detected and destroyed, while only the very best and closest mimics were left to propagate the kind, and produce broods exactly like themselves. Thus, at last, quite unconsciously to the insect itself, the Volucella has grown into the precise counterfeit presentment of the bumble-bees, upon whose young its larva prays; and, strange to say, it has grown so by dint of the hostile efforts of the injured and outraged bumble-bees themselves. The fly they could discover and kill has passed away, leaving no descendants; but it is the progeny of the flies whose disguise they have never been able to penetrate that preys upon them with perfect impunity to-day.

Speed of Working on Submarine Cables.—According to recent trials of the speed of working on the Jay Gould cables laid across the Atlantic from Penzance to Canso, in Nova Scotia, 1,000 code words were sent from Penzance and received at the Canso station in 81 minutes, including all repetitions and corrections. The 1,000 words consisted of 7,288 letters, which is about equivalent to 1,458 words of five letters each, the average number for the English language.

STRANGE COINCIDENCES.

By Richard A. Proctor.

MANY imagine that because of the singular nature of some series of coincidences, there must have been special significance in them. It is well therefore to notice that odd coincidences, in which it would be absurd to imagine any particular meaning, very frequently occur, nay probably are all the time occurring, only most of them remain unrecorded. A case was cited recently in the *Times*. A person whom we may call Brown No. 1, only the real name was not so common, found in his pass-book the sum £22. 0s. 7d. entered on the credit side, and not knowing how it came to be recorded there, asked for particulars. Inquiry being made, it appeared that the sum of £22. 0s. 7d. had been paid in for another customer of the same name (surname and Christian name both) on the same day that the entry of £22. 0s. 7d. had been made on account of Brown No. 1. It was naturally supposed that there was some mistake. But on further inquiry it appeared that both entries were correct,—the odd amount being made up in the case of Brown No. 2 by a number of small items, while in the case of Brown No. 1 the odd sum was a dividend on some Indian stock. If the case were not so obviously insignificant, how clearly it would seem that there was a special meaning in the series of coincidences. That among the customers of a bank two should have the same (not very common) surname and Christian name, is not very wonderful. That to two customers the same sum should be paid in on the same day would not seem very wonderful, unless, as in this case, the amount were rather an odd one,—and even then, if the amount arose in the same way, as a dividend for instance on a round sum like £1,000, it would not be very remarkable. But the actual combination was exceedingly remarkable, and if one could only imagine any conceivable warning or token conveyed by facts so unimpressive in themselves, one would say here certainly was a sign or portent meant to be most carefully attended to.

I was reminded of this *Times* story by two or three odd little coincidences which happened to me lately—all within a week.

First, I received when at Plymouth a letter from the neighbourhood of Birmingham, in which an old college acquaintance, a "stroke" behind whom I had rowed in several races, invited me to stay at his house during my visit to the Midland metropolis. Within a few hours, I receive a letter from another old college friend, a stroke behind whom I had rowed in several races, inviting me to stay at his house in Tavistock during my lecture tour in the west. I had not seen or heard from (or even heard of) either of these Johnians for more than 25 years. Moreover they were the only strokes behind whom I ever rowed in college races, having myself been stroke in all the other races in which I rowed. It was surely an odd thing that when in a city far from the abode of either, I should within a few hours receive letters from both to the same general purport. Yet as surely I could find no sign or portent in the matter.

Four days later I learned at Malvern that a letter duly placed in the delivery box of the Queen's Hotel, Birmingham, had been delayed in transmission. I presumed it had been put in when the box was empty. The envelope was a large light-brown one (almost half as large as a page of Knowledge), the contents not enough to take away from the flatness of the letter, and I fancied it must have lain unnoticed when the small letters above it were taken out. Hearing of its non-arrival in London, I telegraphed

to the manager of the hotel (where I expected to be the same day), "Important letter posted Tuesday not yet received" (Thursday); "see if in your letter-box," &c. This was misunderstood, and reply came, "Large packet of letters received; am forwarding it and other letters by 12.40 train." My reply to hold letters till I came was just in time to prevent a number of KNOWLEDGE letters from being sent on a useless journey, which would have considerably delayed my work with them. The way in which the letter had miscarried was rather strange. I had written a little note on the corner telling the person to whom the letter was sent what my address would be the following day; and some foolish clerk had carefully sent the letter, *not* to the address written staringly across the envelope, but to the address appearing as part of this little corner note. (It is hardly necessary to say that after this foolish blunder and the annoyance caused by it all round, an extra charge was made when the letter was delivered.) Here the coincidence consisted in the odd and almost inconceivable stupidity of the post-office people on the one hand and on the other in the circumstances which made it antecedently likely that the mistake arose at the hotel. Then the misinterpretation of my telegram came to complete the cross-purposes. In this case there was really a warning. For it made me tremble (with two r's) to think what would have happened if my editorial letter to the printers with make-up, proofs, &c., &c., were at any time to be similarly interrupted in transit.

However this was not quite the end. After sending off the second telegram, I was on my way from Malvern to Birmingham where I expected to be at 4.47. Changing at Worcester I had bestowed myself in a first-class through carriage for Birmingham. Now, grant the following conditions, and consider the infinitesimal minuteness of the chance of my *not* reaching Birmingham by that train:—First, I am *alone* in a first-class carriage; secondly, the carriage is really a through one for Birmingham; thirdly, no accident occurs; fourthly, no occasion arises for me to leave my seat; *but*—here are the elements out of which disturbance is to be produced—fifthly, *two* first-class passengers are at Bromsgrove (where we get 21 minutes after leaving Worcester) intending to go to Derby; one second-class passenger is alone in a rear carriage of the train I am in; that rear carriage is badly attached; at Barnet Green there is an excitable station-master; and finally in our train there is a stolid guard. Can *these* elements be so combined as to cause me to be delayed at Birmingham, and so to lose certain opportunities for work, on which I had counted? They *could*, unlikely though it may seem: and as a matter of fact they *did*. The two first-class passengers get by mistake into a Birmingham carriage; the second-class passenger, being alarmed by the swaying of his carriage, gets into mine; a telegram is sent to Barnet Green "two first-class passengers for Derby in the Birmingham train;" excitable station-master there says to stolid guard, "Find two first-class passengers for *Birmingham* (*sic*) and put into forward carriage;" stolid guard though knowing (it appears later) that the forward carriage is *not* going to Birmingham, nevertheless does what he is told. I and unfortunate fellow-passenger (who is going up to Birmingham to get ten minutes' talk with a friend who leaves at 5.10) are busily bundled into the wrong carriage; and at the next station are informed by stolid guard that it does not go to Birmingham. I am left to kick my heels till a train arrives which will take me to Birmingham; and unfortunate passenger takes the next train back to Worcester. What were the chances that these things, unless specially *planned*, would have come off so strangely?

If it had so chanced that either the carriage I got out of or the one I got into had been smashed up in a railway accident, what view ought I to have taken of the escape in the one case or the mishap in the other? When I was injured in a railway accident last July it happened by a singular chance that my wife, who with some relatives had been travelling with me up to the previous evening, was for a few hours not in my company, but was to have joined me at Bishopstoke, into which place my train was running when the collision took place. If I regard it as a lucky chance, which assuredly I do, that she was not just then with me, how am I to view the unlucky chance for me that just then I was not with her? A thought of that sort always suggests itself to me when I hear expressions of special thankfulness for escape where others have suffered. Logically one cannot assert special favour in one set of cases without asserting special disfavour in the others. I suppose, indeed, it is thus that persons who (being of unscientific turn of mind) have no idea of causation, recognise special judgments when some striking accident happens, deeming that those destroyed must needs have sinned in some way beyond other men,—an idea still commonly entertained though so strongly rebuked when propounded in the case of the Tower of Siloam. Even more unreasonable is the idea that though most of the men, women, and children, who perish in some great disaster—like the destruction of the *Princess Alice* for example—were no worse than their fellows, the disaster was specially sent to punish some national shortcoming, for which they were the scapegoats. Here is the veritable Oriental idea of Deity, as originally conceived by those who knew and reverenced only one form of power, that of the Sultan or Caliph, who, when offended, deems it good policy to punish the offender's kindred, however innocent of offence.

THE BIRTH AND GROWTH OF MYTH.

By EDWARD CLODD.

XX.—CONCLUSION.

THE serial form of publication has its advantages in these run-and-read days in compelling the writer to pack his thoughts closely together, but it has its disadvantages in breaking their sequence, and compelling the reader to turn to back numbers for the missing links.

The multitude of subjects traversed in these chapters compelled presentment in so concise a form that any attempt to gather into a few sentences the sum of things said would be as a digest of a digest, and it is, therefore, better to briefly emphasise the conclusions to which the gathered evidence points. It was remarked at the outset, when laying stress on the serious meaning which lies at the heart of myths, that they have their origin in the endeavour of barbaric man to explain his surroundings. The mass of fact brought together illustrates and confirms this view, and has thereby tended to raise what was once looked upon as fantastic, curious, and lawless, to the level of a subject demanding sober treatment and examination on strictly scientific methods.

Archbishop Trench, in his "Study of Words," quotes Emerson's happy characterisation of language as fossil poetry and fossil history: "Just as in some fossil, curious and beautiful shapes of vegetable or animal life, the graceful fern, or the finely-vertebrated lizard, such as have been extinct for thousands of years, are permanently bound up with the stone, so in words are beautiful thoughts and images, the imagination and the feeling of past ages, of men long since in their graves, of men whose very names

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have perished, preserved and made safe for ever."* In like manner, we may speak of myths as fossil ethics and fossil theology, but, with more appositeness, as embryonic ethics and theology, since they contain potentially all the philosophies and theologies "that man did ever find."

And to the student of the history of humanity who rejoices in the sure foundation on which, tested in manifold ways, the convictions of the highest and noblest of the race rest, the value of myth is increased in its being a natural outgrowth of the mind when, having advanced to the point at which curiosity concerning the causes of surrounding things arises, it frames its crude explanations. For not that which man claims to have received as a message from the gods, as a revelation from heaven, but that which he has learned by experience often painful and bitter, and which succeeding generations have either verified or improved upon, or disproved altogether, is, in the long run, of any worth. Through it alone, as we follow the changes wrought in the process from guess to certainty, can we determine what was the intellectual stage of man in his mental infancy, and how far it finds correspondences in the intellectual stage of existing barbaric races.

Thus, the study of myth is nothing less than the study of the mental and spiritual history of mankind. It is a branch of that larger, vaster science of evolution which so occupies our thoughts to-day, and with which the philosopher and the theologian must reckon. The evidence which it brings from the living and dead mythologies of every race is in accord with that furnished by their more tangible relics, that the history of mankind is a history of slow but sure advance from a lower to a higher; of ascent, although with backslidings oft. It confirms a momentous canon of modern science, that the laws of evolution in the spiritual world are as determinable as they are in the physical. To this we, for the enrichment of our life and helpful service of our kind, do well to give heed. Wherever we now turn eye or ear the unity of things is manifest, and their unbroken harmony heard. With the theory of evolution in our hands as the master-key, the immense array of facts that seemed to lie unrelated and discrete, are seen to be interrelated and in necessary dependence—"a mighty sum of things for ever speaking." That undisturbed relation of cause and effect which science has revealed and confirmed, extends backwards as well as reaches forwards; its continuity involves the inclusion of man as a part of nature, and the study of his development as one in which both the biologist and the mythologist engage towards a common end.

A New Selenium Cell.—At the recent meeting of the American Association for the Advancement of Science, Professor Mendenhall announced the formation of selenium cells of very low resistance by Mr. C. E. Fritts, of New York. Low resistance selenium cells are a desideratum, and Mr. Fritts' cells, the full construction of which was not explained by Professor Mendenhall, attain their end by means of large surfaces of selenium, instead of narrow surfaces as in the older cells. Another peculiarity, which involves a new observation, is that the light in the Fritts cell is allowed to fall on the selenium in the same direction as the electric current passes, and not at right angles to the direction of the current. This is a very important point, demanding further investigation, and now that selenium can be manufactured more cheaply it will probably be largely experimented with. The cells of Mr. Fritts can be made of 9 to 10 Ohms resistance. They can, moreover, be easily repaired on breaking down.—*Engineering.*

* "Study of Words," p. 5.

TRICYCLES IN 1883.

By John Browning,

Chairman of the London Tricycle Club.

MUDGUARDS, WRINKLES, LUBRICANTS, AND BRAKES.

A RECENT number of Knowledge contains a request from a correspondent for advice respecting the use of mudguards. During the same week I received letters from other correspondents asking my opinion respecting lubricants, brakes, and the construction of the Humber tricyle. As these matters are all of general interest I propose to answer them in this article.

With reference to mud-guards, I may say at once that the experience of my friends, as well as my own, is that we do not get so muddy when riding small-wheeled tricycles as when riding machines with larger wheels, because the tyres are so low that they do not touch us. Hind-wheel-steering tricycles, though inferior, on the whole, to front steerers, are decidedly superior to them in respect of cleanliness in riding. But if a front steerer has a mudguard of stout leather, in the shape of a triangle, the base of which is downward and comes within two inches of the ground, attached to the thin iron guard which is always fixed to it by the manufacturers, there is little difference to choose between them.

Light leather guards could easily be fixed above the side wheels to any small-wheeled tricycle, so as to catch all mud thrown off by them in such a direction as to reach the rider.

Respecting lubricants, the best known for general use is made by adding two or three teaspoonsful of paraffin to a pint of sperm oil. This mixture also burns well in tricycle lamps. Mr. Grace has used with success as a lubricant vaseline thinned with sufficient paraffin to enable it to be poured into a pocket oil-can.

For the chains of my tricycles, I have for some time used vaseline and finely powdered plumbago or black-lead. This has the disadvantage that dust adheres to it.

Mr. Grace has shown me that paraffin and black-lead applied to chains quickly dries, and leaves a surface to which dust will not adhere. After two or three applications the chain becomes coated with black-lead, and runs silently.

I do not propose to say anything about tyre-brakes, as they are almost extinct, and will soon, I trust, be quite so. With hand-brakes the great difficulty is to prevent any oil from getting on to the drum. When this happens, it generally arises from the chain having been too profusely oiled. By adopting the paraffin and black-lead as a dressing for the chain the risk of this mishap, which may lead to a very serious accident, will be avoided. Should it have happened that oil has got upon the drum, first wipe it as dry as possible, and then crush some common resin upon the drum, and work it into the leather band by holding the brake very lightly on, and moving the machine about. Repeat this several times if necessary.

Powdered resin, mixed with *a very little* oil, is an excellent dressing for the strap of a hand brake, but I have found vaselin with a small amount of whiting still better.

Here I must add a word of caution not to apply either of these compounds to the band-brake of a Humber tricycle, as the action of the brake of this machine, without anything to increase the friction, is sufficiently powerful, and one of the great difficulties experienced in riding it consists in the ease with which the hind wheel is lifted off the ground by putting on the brake. I have accustomed myself to ride my small Humber with only the

first finger of my right hand on the handle of the brake. Even using one finger to check the machine in this manner, I have frequently lifted the hind wheel when I have been compelled to apply the brake rather suddenly, and that when I have been riding up hill.

A correspondent to whom I am indebted for a thoughtful communication, asks me if the "Humber" "would not be improved on the score of safety by throwing more weight on the hind wheel, so as to keep it more firmly on the ground?"

My reply, given after a year's continuous practice in riding the machine, is that, paradoxical as it may appear, the more weight you place upon the hind wheel the more difficult it becomes to control the machine.

The secret of riding the "Humber" is to lean well forward so as to take as much weight off the hind wheel as possible without going over the handles. When going down hill, if the hind wheel gets into a rut or deep dust or stiff mud and the machine will not answer in steering, the only way to get over the difficulty is to lean forward as far as you safely can, to apply the brake *cautiously*, and to drive forward against the brake. This will steady the machine directly, and cause it to answer the steering perfectly.

THE SUN'S DISTANCE.

By Professor R. S. Ball, LL.D.,

Astronomer-Royal for Ireland.

(*Continued from page* 285.)

IT was on the first night of the present century, a date very easy to remember, that the first of the minor planets was discovered; a few others were quickly added, and forty years later the career of discovery was re-opened. Fresh planets were added by units, by tens, and by scores, until at the present moment we recognise about 240 of these objects revolving around the sun in the gap between Mars and Jupiter.

The sun, which controls the mighty planets of our system, does not disdain to guide with equal care the tiny globes which form the minor planets. Each revolves in an elliptic orbit, and at certain times some of them approach near enough to the earth to have their distances measured. The observations can be made with very great precision; they can be multiplied to any extent that may be desired. They can be discussed with geometrical accuracy, so that from them one result and only one can be deduced.

In speaking of these planets as small objects, I must be understood to use the words in a comparative sense. They are small as planets, but perhaps the area of an average one might be comparable with that of a good-sized English county. The discoveries of minor planets have added enormously to the labours of those astronomers who compute the movements of the solar system. The task of predicting the places of the minor planets has been for many years most ably accomplished in the Berlin "Ephemeris." The editor must be sometimes alarmed at the daily extension of his list.

Many of these bodies are of but little interest. Perhaps it would be no great harm to allow a good many of them to get lost again and be no more followed by telescopes or computers. Some of these little bodies have, however, a great astronomical future. They seem destined to tell us more faithfully than Venus or than Mars what is really the distance from the earth to the sun. The very small ones will not answer; they can only be seen in very powerful telescopes, and they do not admit of being measured with the necessary accuracy. It is also obvious that the planets to be chosen must be as near to the earth as possible. They should have orbits possessing a high degree of eccentricity, so that when in perihelion and in opposition simultaneously the approach may be made as close as possible. Under favourable circumstances a minor planet will approach the earth to a distance but little more than three-quarters of the distance of the sun. These various conditions limit the number of minor planets available for this purpose to about a dozen, of which one or two will usually be suitable each year.

About two years ago Mr. Gill invited astronomers in the Northern Hemisphere to co-operate with him in the Southern in an attempt to apply this method to Victoria and to Sappho. It became my duty to co-operate in this scheme so far as my opportunities went. As the planet pursues its course through the sky, and as the sky is everywhere studded over with countless myriads of minute stars, it is evident that the planet itself so like a star will always have some stars in its immediate neighbourhood. As the movements of the planet are well known, it is possible to foretell where it will be on each night that it is to be observed.

The scheme was completely drawn up many months before the observations were to commence. Each observer who participated in the work was thus advised beforehand of the stars which were to be employed each night. Viewed from any part of the earth, from the Cape of Good Hope or from Great Britain, the positions of the stars are absolutely unchanged. Their distance is so stupendous that a change of place on the earth displaces them to no appreciable extent. But the case is different with Victoria. It is hardly one millionth part of the distance of the stars, and thus the displacement of the planet when viewed from the Cape and when viewed from Europe is measurable. The measurements are made from a comparison star with a micrometer or a heliometer. The star is one beautifully-defined point, the planet is another, and the difference of declination between the two can be measured with a high degree of accuracy. Two comparison stars symmetrically placed with regard to the planet are usually employed, as a number of sources of error can be thus eliminated. The displacement of the planet is to be elicited by comparison between the observations in the northern hemisphere with those in the southern hemisphere. The observations must be made as nearly as possible at the same time, due allowance being made for the motion of the planet in the interval.

Although every precaution is taken, yet the fact remains that we are obliged to compare the measures made by observers in the northern hemisphere with those made by different observers, and, of course, with different instruments in the southern hemisphere. In this respect we are, no doubt, at no greater disadvantage than in the transit of Venus; yet it is possible to obviate even this difficulty, and thus to give the minor planet method a great advantage over its rival. The difficulty would be overcome if we could conceive that an observer and his observatory, after making a set of observations on a fine night in one hemisphere, were to be transferred, instrument and all, to the other hemisphere, and there to repeat the observations. This problem can be solved without any miraculous agency, and in it we have undoubtedly the most perfect mode of measuring the sun's distance with which we are acquainted.

This method has already been carried out with success by Mr. Gill in the case of Juno, but there are other planets more favourably situated, and the work can be done for a

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mere fraction of the expense of the much more cumbrous transit of Venus. Take, for instance, one of the little planets which sometimes approach to within 70,000,000 miles from the earth. When the opposition is drawing near, a skilled observer is to be placed on some suitable station near the Equator. The instrument he is to use should be the heliometer. It can be used to measure stars at a greater range than is attainable with the filar micrometer. The measurements are to be made in the evening as soon as the planet has risen high enough to enable it to be seen distinctly. The observer and the observatory are then to be transferred to the other side of the earth. How is this to be done? Say, rather, how you could prevent it being done. Is not the earth rotating around its axis, so that in the course of a few hours the observatory on the Equator is carried bodily round for thousands of miles? Before the morning dawns the observations are to be repeated. The planet is found to have changed its place very considerably with regard to the stars. This is partly due to its own motion, but it is also largely due to the parallactic displacement arising from the rotation of the earth, which may amount to as much as twenty seconds.

The measures on a single night with the heliometer should not have a mean error greater than one-fifth of a second, and we might reasonably expect that observations could be secured on about twenty-five nights during the opposition. Four such groups would give the sun's distance to one-thousandth part. The chief difficulty of the process arises from the motion of the planet during the interval which divides the evening from the morning observations. This, it must be admitted, is a drawback to the method. It can, however, be avoided by diligent and repeated measurements of the place of the planet with respect to the stars among which it passes.

Let us hope that long before another transit of Venus shall come round the problem will have been satisfactorily solved by the minor planets. It will surely be expected that I shall not close this lecture without an attempt to say what the distance of the sun is so far as modern research has gone. Reviewing all the different methods, the most probable value seems to be 92,700,000 miles. It does not seem likely that this can be erroneous to the extent of 300,000 miles. The distance of the sun is one of the most important constants in the universe. It is indeed a constant in a very emphatic sense. The planetary perturbations which affect so many other elements of the solar system are powerless to touch this constant. Once the distance of the sun has been measured, the telescope with which the observations were made may moulder, and the astronomer who used it may survive only in name, but the work he has accomplished will remain true for countless ages of the future.

ON LUNAR DELINEATION.

By the Rev. T. W. Webb.

ATTENTIVE observation of the lunar surface has now been, from various causes, comparatively dormant on my part for a considerable time, though not, I hope, without the prospect of renewal at some future day. But, in the meanwhile, it has given me great pleasure to remark with how much earnestness and success these inquiries have been pushed forward by younger hands, and how far selenography stands in advance of the position it occupied during the earlier portion of the present century. There is little occasion for surprise in this. During a period when a new and unprecedented interest has been awakened in astronomical pursuits, and competent instruments—to say the least of them—have been placed within the reach of all classes, nothing could be more natural than that attention should be directed to an object so comparatively near, so frequently visible in its returns, so accessible even to small telescopes, and so crowded with strange configurations as our own satellite; and many an amateur, who would be baffled from deficient optical power, or want of experience, in an attack upon planetary details or "close doubles," may be readily attracted by the broadly developed surface of the moon, and become anxious to know how he may turn to some useful account his opportunities of observation. And as far as the readers of Knowledge are concerned, the recent interesting and valuable series of papers by "F.R.A.S." would contribute largely to encourage such a taste, and to lead young or unpractised observers not merely to run over that strange and fascinating scenery with a superficial gaze, but to study its features more carefully in detail, and if they have some facility with the pencil, to attempt its delineation. This would certainly be a most interesting employment of spare time, and with diligent perseverance might lead to a degree of success which would fully justify the pains expended upon it at the outset. It is with a view of assisting such beginners that I propose to bring the following remarks before them.

We may begin by setting aside any discouragement from the success that has attended photography—as to which it may be supposed that from the marvellous development of its resources it must soon supersede every other mode of delineation. There is, indeed, much in such an objection, but not enough to discourage the efforts of a careful artist. The great strength of photography lies in the fact that it misses nothing. It would hardly be supposed by those unacquainted with the subject how fallible is the vision of an ordinary, sometimes even of a trained eye, or how often features are overlooked, especially in a hasty observation, which are recorded by the camera. Nor can we question its great advantage in point of rapidity, and, when suitably arranged, facility of manipulation. But there is something to be said on the other side. Photographic appliances are within the reach of comparatively few of those who are qualified to do good service, and the opportunities for really sharp camera-work are limited, as compared with those for direct eye-observation, for the evident reason that in the one case a satisfactory result can only be obtained from such uninterrupted steadiness of definition as may be long waited for in vain, in the other the eye may be often capable of laying hold on the true form and character of an object, notwithstanding the interference of such atmospheric agitation as would render the camera useless, or of utilising the happy intervals in an unquiet hour, when a momentary clearing brings out in beautiful distinctness features immediately lost again in impenetrable diffusion. For the general mapping of an extensive region, and laying down its form and boundaries in due proportion, photography is by far the best suited; but there may always be room for filling-in detail by the eye. It is best to understand at once that if we hope to make our work really useful, we must lay aside all ideas of representing large areas—for one reason, because all that work has been abundantly done already; and for another, because, during the time that would be necessarily occupied in such a sketch, the illumination of objects lying respectively far to the E. or W. would have altered sufficiently to make the design inaccurate at one end or the other, however faithful in separate details. And, for more than one reason,

nothing should be attempted that cannot be well mastered in a single observation.

Then, again, something has to be said as to the necessity of a certain degree of proficiency in the art of correct drawing. An eye sufficiently accurate to comprehend the proportions of what lies before it is by no means of constant occurrence; nor a hand adequately trained to transfer them faithfully to paper. Artistic taste is not much concerned in the matter. We do not want a pleasing picture, but a faithful likeness; and the two are not always as well balanced as they are in the portraits, alike beautiful and accurate, given by Green in his views of the planet Mars. Practice, however, will do much to improve both eye and hand; and especially a resolute determination not to be discouraged by early failure.

Again, it is an indispensable qualification to be well acquainted with "relief," as shown by light and shade, without which we may be needlessly surprised, or even hopelessly perplexed, in the interpretation of what we see. In this important respect we may especially recommend the careful examination of a somewhat irregular white surface, such as a sheet of plaster of Paris, or even smooth mortar, spread on a board, on which elevations or cavities may be formed; the oblique exposure of this to the light of the sun, or a lamp, from either side, and at varying angles, will readily show what strange differences of aspect may result from so simple a cause. With certain forms, and in certain positions, it will soon be seen how great a proportion those differences bear to a comparatively slight change in the direction of the incident ray; what "giant-like" dimensions may be assumed by the shadows of moderate elevations, what pointed spires of blackness may be formed, perhaps for a short time only, by blunt or rounded summits, and what singular deformations may take place when they are thrown across or terminate in irregular ground. The effect also must be noted of a slight variation in the direction of the illumination, not only, as is constantly in progress, from W. to E., or the reverse, but on certain occasions also from N. to S. Such a variation actually exists in consequence of a slight inclination of the Moon's axis to the plane of its orbit, and though very limited in amount, it may, under some conditions, be appreciable enough to produce changes that would otherwise be unintelligible; a straight ridge, for instance, running E. and W. with a similar inclination on either hand, might from this cause cast a shadow now on one, then on the other side, or become imperceptible from want of shade, according to the variation in the lunar azimuth of the rising or setting sun. Or a group of luminous points, the summits of some lofty and complex mountain mass, just touched beyond the terminator by the rays of the rising or setting sun, may appear to vary in form or number in different lunations, from the same cause, which is equivalent to a very slight change of seasons on the Moon.

Again, we must not leave out of account the change of perspective foreshortening due to the effect of libration, which is constantly varying, from night to night, the position of objects as referred to the limb, or, what is of course the same thing, the apparent centre of the lunar disc. It is not necessary in this place to enter into the cause or the limits of this disturbance in the optical presentation of the moon's visible hemisphere to the earth; but the attentive observer will soon be sensible of its existence, from the changing proportions of the ellipses into which the circular formations are projected, and the varying visibility of minute details, especially on slopes receding from the eye. The perspective alterations arising from this cause increase, of course, rapidly with the increasing distance from the centre of the disc; and towards the limb they become so exaggerated, and often puzzling, that it would be mere waste of time for a beginner to attempt the delineation of those regions; excepting, indeed, in one case—that of actual representation in profile. For it occasionally happens near the time of full moon that some huge mountain mass, such as Leibnitz or Dörfel, is thrown up in imposing relief against the dark sky beyond the regular circle of the disc; or that the points of the crescent are carried on in detached patches—islands, as it were, of light—along the dark limb. Such projections lend themselves readily to the pencil, and offer an outline worthy of preservation.

The facility of delineation is increased by the uniformity of tone in the shadows, which, in the absence of a reflective atmosphere, are of unbroken blackness. Their edges, too, are sharply defined; for though they must be attended, like every terrestrial shadow, by a penumbra, or dusky border, arising from the breadth of the star-disc, yet this, excepting in very oblique illumination close to the terminator, subtends too small an angle at the distance of the moon to be worthy of notice; in fact, it would not be perceptible with such instruments or magnifying powers as are now under consideration.

It is scarcely necessary to say that in such work a loose, undecided, *sketchy* manner is especially to be avoided. Such designs may possibly recall what was actually seen to the mind of the artist himself, but to others they may only be unintelligible or even misleading. The rule of good drawing in ordinary cases is at least equally applicable here—that every line should have a meaning. As far as possible, nothing should be left to memory; and an approximate date should accompany every drawing, together with a specification of the size and power of the telescope employed, and the quality of definition.

PRETTY PROOFS OF THE EARTH'S ROTUNDITY.

By Richard A. Proctor.

(*Concluded from page* 276.)

EVERY one who has been much at sea must have (or rather *ought* to have) noticed how very markedly even a slight change of elevation affects the apparent position of the sea horizon as seen athwart the upper masts of a distant ship. Where the sea horizon crosses the lower masts the effect is not so marked; but when the air is clear so that the sea horizon is sharply defined and the ship beyond it clearly seen, the change is obvious enough in this case also. I have often been struck by the singular way in which a distant ship seems to rise and sink bodily as you watch it through a good glass, when in reality the change is due to the steady and almost imperceptible pitching of the ship from which you view her. To catch this effect best you should observe of course from the bow or stern, when the ship is crossing a long swell, the swell being very slight and the sea in other respects as still as may be. You rise and sink then through perhaps three or four feet by a slow movement scarce noticeable under any circumstances, and quite imperceptible when the eyes are directed on a distant hull-down ship. It is obvious that as you thus rise and sink the line to the horizon sways over the curved surface of the sea, somewhat as a plank might see-saw over the large round trunk of a prostrate tree. We see from Fig. 20 why the effect would be greatest on a distant object. For if *a*, *b*, are the positions of the eye as

the stern or bow of a ship rises and sinks, the lines *a* A *p*, *b* B *q*, separate more widely the farther they are carried from A and B. Thus on a ship at P the distance *q p* separating these lines might be half the height of the mast, while on a similar ship at P′ the corresponding distance *q′ p′* might be but a quarter of the mast's height.

All this is so obvious that it scarcely needs dwelling upon; though it is strange how few of those who have the phenomenon before their eyes even notice its nature, far less consider its significance. When observed and considered a little, it constitutes one of the most effective illustrations of the earth's rotundity I know of.

But I have in reality introduced this ocean proof for the purpose of introducing another, which struck me as one of the most singular in appearance of all the effects of the earth's rotundity I had ever noticed. It will be observed that the line *a* A, Fig. 20, is considerably longer than the line *b* B, so that an object of given dimensions just on the horizon for the point *b* would look considerably larger than a similar object just on the horizon for the point *a*. At

Fig. 20.

sea one has no chance of noticing the effect of this change of horizon distance, for the simple reason that there is nothing to guide the eye as to the real distance of the sea-line. But on land it may in certain cases be different.

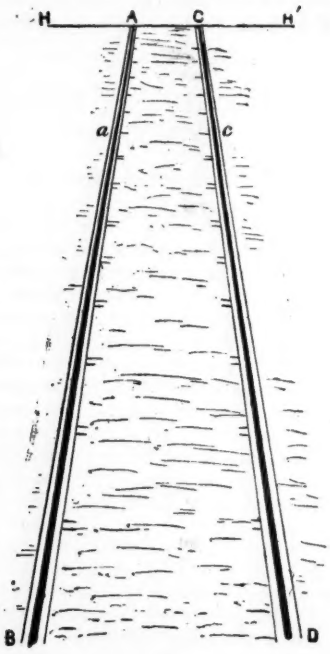


Fig. 21.

Thus the prairies in America are in some places perfectly level over a length and breadth of many miles. Suppose now that two parallel lines were drawn from C, Fig. 20, on the surface of the earth (whether sea surface or absolutely level land surface) towards B and A. Then from *a* the apparent extremities of the two lines (at the horizon) would be seen at A, while from *b* the apparent extremities of the two lines would be seen at B; and since *a* A is greater than *b* B, it follows, since the lines are parallel, that the apparent extremities as seen from *a* will be nearer than as seen from *b*.

Now, in travelling by rail over the prairie regions in America, one occasionally passes over a perfectly direct track on an unchanging level for several miles. And then one can look back from the rear carriage on two parallel lines just such as I have considered in the last paragraph. Suppose now that standing up on the rear platform the eye is as at *a*, Fig. 20. Then the rails will be seen as at B A, D C, Fig. 21, meeting the distant horizon H H′ at A and C. But if now, by stooping, the eye is brought to a considerably lower position as at *b*, Fig. 20, then the rails will be seen as *b a*, *c d*, Fig. 22, meeting the less distant horizon *h h′* at *a* and *c*,—*a c* appearing considerably greater than A C, for the simple reason that it is really the same distance (viz. the breadth between the rails) seen much nearer. (In Fig. 21, *a c* indicates the change of distance as compared with A C).

I have never so thoroughly *felt* the rotundity of the earth

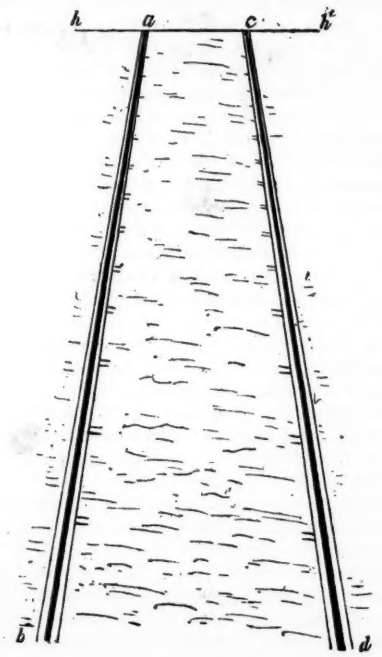


Fig. 22.

as I did on the day (in the spring 1880) when first this illustration occurred to me. I was on the rear platform of a train running smoothly and swiftly over the prairie region of Kansas. In the clear air of that region the two rails on

which we were running seemed to meet the horizon in two sharply defined points like the ends of two slightly slanted rods. Lowering the body the ends drew apart. Raising it they approached again; and alternately raising and lowering the body, keeping the eyes steadily fixed on the horizon, the ends seemed to approach and draw apart as if really moved to and fro.

Of course, this was not in itself a proof of the earth's rotundity, only an illustration. For, a believer in a flat earth might argue that the surface of the prairie was really rounded, and could no more prove the earth rotund than a round hill could. But the illustration becomes a proof for those who know the enormous range of the prairies in Western America, and that if the earth were flat, and the phenomenon we are considering had to be explained by a rotund prairie, the rotundity would have to rise many miles above the earth's level to explain a phenomenon observable over so great a range in distance.

But these papers are not in any case intended for the believers in a flat earth. These are really so few and so foolish that they are not worth the trouble of convincing, even if it were possible to convince by reasoning those who want reasoning faculties. It would be as reasonable to invite a cherub to take a chair as to offer arguments to the earth-flatteners. Our Pretty Proofs, though most of them are really proofs, have been offered chiefly as illustrations likely to interest those who know that in hundreds of ways the rotundity of the earth, the distance of the sun, and the dimensions (generally) of the solar system, have been placed beyond all possibility of doubt and question.

THE END.

SEA ANEMONES

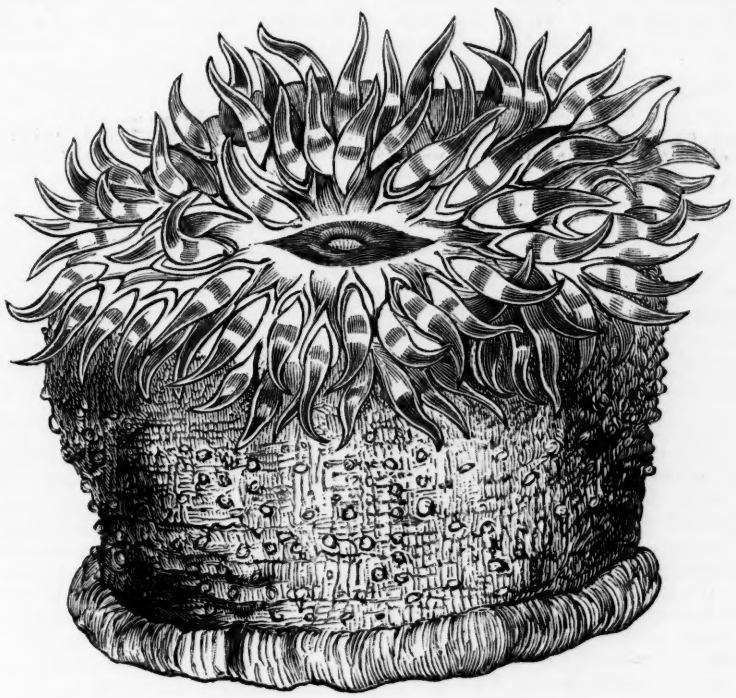
AT THE FISHERIES EXHIBITION.

BY THOMAS KIMBER.

VIII.—THE DAHLIA.

Actinia crassicornis (Müller). *Actinia coriacea* (Cuvier).

THIS large, handsome anemone is found abundantly along all the British coasts. Only one other species, the Strawberry, is more numerous. In colour the Dahlia is very capricious; its disk and tentacles sometimes display rich purple and amber hues, at other times the most delicate rose and white tints. In some instances the disc is rich orange and crimson, and the tentacula are of the purest white, while other varieties are met with comparatively dull in colouring. The tentacles usually are thick short, obtuse, and annulated with white and red. When however, the column is of uniform flesh or cream-colour they are of the same hue and without rings.



Dahlia Anemone the natural size.

In the Fisheries Exhibition there were many fine examples quite equal in size to our illustration. At the present time are to be seen in the Brighton Aquarium, many individuals and some groups not inferior in any respect to the handsomest exhibited at the Fisheries. The curator, Mr. Lawler, has been most successful in this department, and with excessive care has succeeded in maintaining for some years one of the finest exhibitions of sea anemones in the United Kingdom.

A distinctive feature of Crassicornis is the quickness with which its body is swollen with water and assumes a bladder-like and diaphanous form. In this condition the

tentacula are elongated and can be distinctly seen to be tubular with an orifice at each apex, and when touched after being taken out of their native element, will sometimes squirt thin jets of water more than a foot in height, and these will continue to rise until the body is nearly emptied and diminished to half its former dimensions.

This species varies widely also in wartiness; in some individuals these protuberances are very small, and in others the body is quite smooth. More frequently, however, the column is covered with warty glands, by means of which gravel and fragments of shells are attached to it so as to completely obscure the animal, and produce the appearance of a heap of sand and shells. Mr. Gosse, with respect to this habit, observes that you may hunt among the rocks till the rising tide covers them and, finding hundreds of Strawberries but not a single Dahlia, go away with the conviction that the latter is a scarce species; but to-morrow an initiated friend accompanies you to the same spot, and, pointing with his toe to the angle, says, Here they are! and here! and here! Three, four, and half a dozen in a group, and you are tired of collecting before the profusion fails.

Dr. Johnston, the chief authority between Ellis and Gosse, asserts (Vol. I., p. 226) that Actinia crassicornis never indues itself with an extraneous covering, which statement is true only of specimens found in deep water and tidal hollows that are always full. In such situations this gorgeous being remains constantly expanded and unconcealed. The doctor's declaration means, apparently, that he had never met with a specimen on the dry beach.

Although Dahlia is among the largest and most showy of British anemones, and very attractive in an aquarium, it is very troublesome and difficult to keep in health. If not carefully removed from its site with the stone to which it is attached, it will rarely live even for a week, and the least injury to the base or column nearly always proves fatal.

After obtaining a perfect individual free from injury, the utmost possible care should be used in cleansing the stone and keeping the water in the tank pure. On the other hand, as a recompense to the collector for his trouble, it must be remembered that this species is very beautiful, and if a few examples can be obtained and kept in health, they will add greatly to the beauty of his tank.

The tentacles possess the power of clinging strongly to any substance with which they come in contact. On one occasion, says Mr. Crouch (Johnston, I., p. 225), while watching a specimen that was covered merely by a rim of water, a bee, wandering near, darted through the water to the mouth of the animal, evidently mistaking the creature for a flower, and though it struggled a great deal to get free, was retained till it was drowned, and was then swallowed.

A few old writers have related as a fact that Actiniæ were occasionally eaten as a delicacy, and some modern philosophers by a process of inductive reasoning have arrived at the conclusion that sea anemones generally, and Crassicornis more particularly, should be good for human food, and have made most laudable efforts to prove the truth of their reasoning in a practical way. They have proceeded so far as to cook and to eat (or rather swallow) specimens of this species, with the curious result that though they commend the dish to others, they express no wish themselves again to partake of it.

Abbé Dicquemare, Professor of Experimental Philosophy at Havre de Grâce, in a paper which was read before the Royal Society, gives his surmises and subsequent experiences as follows:—"Might not these animals become a fresh supply for our tables, and thereby make amends for the consumption of muscles on which they feed? In order to try the experiment, I gave some anemones boiled in plain water to a cat, who devoured readily twenty of them without any bad effect, and seemed wishful to have more. This induced me to make a further trial, and to get some of them colloped as we do oysters. I swallowed them up myself. Perhaps they may prove still more palatable dressed in some other manner; however, they may be eaten safely."

In another paper, Professor Dicquemare says, "Of all the kinds of sea anemones, I would prefer this for the table. Being boiled some time in sea water, they acquire a firm and palatable consistence, and may then be eaten with any kind of sauce. They are of an inviting appearance, of a light, shivering texture, and of a soft white and reddish hue. Their smell is not unlike that of a warm crab or lobster." The mouth waters, writes Dr. Johnson, at the liquorish description, and I daresay that sea anemones are not less a luxury than the sea urchins of the tasteful Greeks, or the snails of the Roman epicures, but I have not been tempted to test its truth. Rondelatius, having, as I think, Actinia crassicornis in view, is an older witness to its daintiness, and he tells us that it brings a good price at Bordeaux: "Ils la lavent fort et souvent, puis la fricassent legérèment en la poële." Actinia dianthus also is "good to eat," quoth Dicquemare; and Plancus directs the cook to dress this after the manner of dressing oysters, with which it is frequently eaten. Even the hot and peppery anthea has its praise; from it they prepare the dish called *Rastegna*, which is a favourite in Provençe.

Mr. Gosse, in his "Naturalist's Rambles on the Coast of Devon," a most delightful work which all who can should possess, goes much further, and gives every detail necessary for the preparation of an appetising dish of Crassicornis. In our next communication, with the kind permission of the author, we propose to give the paragraph in *extenso*.

JAPANESE miners have some curious customs which sadly depreciate the value of their work. They do not appear to appreciate the fact that "time is money." An engineer who has just returned from the mines of that country tells the *Engineering and Mining Journal* that they light them in a peculiar manner. Every man entering the mine carries with him a large bundle of from 5 ft. to 6 ft. of bamboo cane, slightly beaten before use. This cane is used as a torch. It burns fairly well for a few seconds, until a knot is reached, when the light nearly goes out, and the ashes must be knocked off, a process which must be repeated every half-minute. Every six or seven minutes a new cane must be lighted, so that a good share of the miner's time is occupied in keeping his illumination in a fairly satisfactory condition. Unfortunately Japanese miners are, besides, great smokers, and they use a pipe having a bowl the capacity of which is equal to that of an ordinary thimble. It takes two whiffs to finish it, when the process of filling-up and lighting it must be gone through. Everyone has probably had occasion to watch the great deliberation with which an average Irishman, when at work, will fill his clay bowl when the foreman's gaze is not on him, but imagination simply shrinks from the task of picturing the rapid progress of work intrusted to a smoking Japanese miner.

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Reviews.

MIRACLES.*

SIR EDMUND BECKETT considers that Professor Huxley's restatement of Hume's well-known argument against miracles, with corrections and improvements, requires an express answer; and he gives a very express answer to it in the small book before us. He first considers the case of Huxley *versus* Hume, and then the case of Hume, Huxley and others *versus* miracles. As might be expected of so staunch a *laudator temporis acti*, Sir Edmund Beckett becomes counsel for the defendant in both cases. In the former he makes rather too serious an attack on Professor Huxley's remark that "*in reality* the definition of a miracle as a violation of the laws of Nature is an employment of language which on the face of it cannot be justified." For Professor Huxley is here only asserting what, if we wished to be precisians in language, we should regard as the true meaning of the word Nature—viz., that which is, "the sum of phenomena presented to our experience; the totality of events past, present, and to come." Of course this definition would settle the whole question of the possibility of the supernatural very simply; but for our own part we cannot find that Professor Huxley means this definition otherwise than as what *ought* to be, not what *is*, the accepted meaning of the word Nature; he nowhere lays stress on the perfectly obvious inference from this definition if it *were* the accepted one, which it certainly is not †

Sir Edmund Beckett disposes very effectually of the feeble explanation of certain miracles described in the New Testament as events which really occurred, but were perfectly natural. He leaves unnoticed the argument based on the facts that (1) identical events are related as having occurred in much earlier times, and (2) at first they were so related in direct association with a well-known Nature myth. Yet, in the present position of the subject, it is to this point chiefly that the advocates on either side should direct their attention.

It is indeed rather difficult to understand for whom this work is intended. Those on one side take a certain view which those on the other side are bound to believe that they must not take; "and so," to use Sir Edmund Beckett's own words about a similar case between Protestants and Roman Catholics, "argument is useless."

Yet like everything else of Sir Edmund Beckett's writing the book is well worth reading. Of course, there is an assumption throughout that those against whom he is arguing are not only mistaken but know they are, and that their whole argument is almost too obviously worthless to be worth answering. But though coloured with this affectation, the "pleading" is capital from first to last. It may convince no one who holds at the outset the contrary view; but it will interest and please many of them.

* A Review of Hume and Huxley on Miracles, by Sir Edmund Beckett. (London: Society for Promoting Christian Knowledge.)

† In a clever note, our author takes to task those who object to the use of the word "Infidel" by Christians, "when Christians are called so in Turkey." He says rightly enough that words should be used in England as everybody in England understands them. He conveniently overlooks, however, the fact that the objection to the word Infidel as used by many, is precisely that while its use is justified on the score of its etymology, common usage has given to it a force which is not justified in ninety-nine cases out of a hundred where it is used. The word Infidel, say many of those on whose behalf Sir Edmund pleads, means one who does not believe in sacred truths; such and such men do not believe in what I hold to be sacred truths: I may truly call them Infidels; it is not my fault if common usage gives to this term a different significance, and makes it nearly akin to Miscreant. No one cares to see the word Infidel restored to its true significance: it is the wrong application of the word in its accepted significance to those whom it only fits in its etymological significance which is objected to, and with excellent reason. So again of the word "Religion." "Some writers of that school" (Sir Edmund Beckett does not say what school) "tell us that Religion has nothing to do with a belief in God, because it may mean something else etymologically: we might as well tell them that they have no right to use 'gravity' for universal attraction, though every educated person understands it so. Such writing is mere folly, if it were not done for mischief and delusion." But the real trouble is very different. It is that many of Sir E. Beckett's school (we suppose), when they come across some who are wanting in Religion regarded in the accepted way as a belief in certain doctrines, choose to speak of them as if necessarily wanting therefore in Religion as the word is etymologically interpreted, that is, as necessarily without the binding influence of any restraint from wickedness and immorality. It is a matter of little moment whether the word Religion is understood to mean belief in a future life (say) or that feeling which keeps men from wrong doing: but it is a mistake worth correcting, because it is a gross injustice, when men use it both ways (netting with it first and spearing with it afterwards), saying, Such a man has no belief in such and such doctrines; that is he is without Religion; and therefore, since Religion means etymologically what keeps men back from evil, he is ready for all manner of evil-doing. Thus the word Infidel when justified in its etymological sense is unjustly applied in its familiar and very different sense; while, *per contra*, the word Religion when justified in its familiar sense is unjustly applied in its etymological sense. Such speaking "is mere folly, if it were not meant for mischief and delusion."

SOME CHRISTMAS WORKS.

MESSRS. GRIFFITH & FARRAN publish some charming works for Christmas time and for Christmas presents. Amongst them we note Keble's "Evening Hymn," beautifully illustrated; Edgar Poe's "Raven," a charming edition; "Nora's Trust; or, Uncle Ned's Money," a tale of the work-a-day world, by Mrs. Gellie (M.E.D.), a capital story for girls; "Middy and Ensign," by G. Manville Fenn, meant for boys, but very interesting reading for grown folk; "Paddy Finn," by W. H. G. Kingston, like all his books for boys, excellent; "Chums," a story for youngsters, by Harleigh Severne (illustrated by Harry Furniss); "Punch," by Miss E. C. Phillips; "May to Christmas at Thornhill," by Mrs. D. P. Sanford, very prettily illustrated; "A Christmas Pudding for Young Eaters," by L. C. Skey; "Lily and Her Brothers," by C. E. L.; "Growing Up," by Jennett Humphreys; "Friends, though Divided," a tale of the Civil War, by G. A. Henty, and "From Cadet to Captain," by J. Percy Groves, both well worth reading by older persons than they are written for; and "The Court and the Cottage," by Emma Marshall, whose only fault is that it ends so sadly that many young people are likely to cry over it. The following are among the books for children:—"The Fool's Paradise," "Mirth and Fun for Old and Young" (very good indeed), "Holly Berries and Holly Series," by Ida Waugh.

TELEGRAPHING CHINESE.—Owing to the peculiarity of the Chinese characters, each of which represents a word, not a letter, as in our western tongues, the Danish Telegraph Company (the Great Northern) working the new Chinese lines have adopted the following device. There are from five to six thousand characters or words in the ordinary Chinese language, and the company have provided a wooden block or type for each of these. On one end of this block the character is cut or stamped out, and on the other end is a number representing the character. The clerk receives a message in numbers and takes the block of each number transmitted and stamps with the opposite end the proper Chinese character on the message form.

Editorial Gossip.

A GREAT pressure on our space this week causes several promised papers to be delayed till next week's number.

I HEREBY return my thanks to the full audience which greeted me so pleasantly on Monday at the Town Hall, Kensington. The hall is a magnificent room for speaking in; I have never known any where the management of the voice was easier. Those who have not spoken much in public can hardly imagine what a difference the acoustic properties of a hall cause. Where speaking is easy, the thoughts flow more readily, and all that the lecturer has to do is made easier to him, and the lecture pleasanter in every way to the audience. On Tuesday, when I addressed a large audience in the Rink Hall, Blackheath, I felt the difference in a very marked degree. Speaking in a long low room with a slant roof differs as much from speaking in a room like the Town Hall, Kensington, as shouting through a speaking-trumpet differs from parlour converse. Imagine the effect of trying to explain, reason, sketch, and in passing make light jests, through a speaking-trumpet.

I WONDER how often during a lecture I ought to state that not the theory running through the lecture should be chiefly considered, but the facts which the theory is intended to associate together, and in some degree to explain. I very carefully noted this in my first lecture at Kensington, yet in the kindly notice which appeared on Tuesday in the *Daily News* the circumstance is overlooked, and my lecture described as though intended to advance and support certain theories.

"Let Knowledge grow from more to more."—ALFRED TENNYSON.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

All Editorial communications should be addressed to the EDITOR OF KNOWLEDGE; *all Business communications to the* PUBLISHERS, *at the Office, 74, Great Queen-street, W.C.* IF THIS IS NOT ATTENDED TO DELAYS ARISE FOR WHICH THE EDITOR IS NOT RESPONSIBLE.

All Remittances, Cheques, and Post Office Orders should be made payable to MESSRS. WYMAN & SONS.

The Editor is not responsible for the opinions of correspondents.

NO COMMUNICATIONS ARE ANSWERED BY POST, EVEN THOUGH STAMPED AND DIRECTED ENVELOPE BE ENCLOSED.

ORDNANCE MAP MEASUREMENTS.

[1002]—Apparently, our retrenching Government out-parallaxes "Parallax" and not only holds earth is flat, but that it is flat as pancakes or paper maps, and that hills and dales are mere illusions.

Certain officials have certain allowances when at work beyond a specified distance from home. A Parliamentary Return actually defines this to be "by the nearest available route," which seems fair common sense.

But "some Treasury *Hampden*, born to blush unseen," has discovered that a simpler way to measure is by a pair of compasses, so that not only does the Treasury calculate these terrestrial distances irrespective of roads, but irrespective of ups and downs, as though the people's servants could travel through air like the proverbial crow. The official proof of the accuracy of this method lies in the fact that it docks certain coins; but as I trow even the Lords of the Treasury can neither buy nor sell land on this style of measurement, can you tell us any other cases in which this style has place? Is it not a fact that in measuring from an ordnance map a surveyor or other person skilled in map-reading takes into account the contour as shown by the lines which give rising ground according to their distance from each other? Or, to put it more succinctly, given two points on opposite sides of Snowdon, can the distance common-sensibly be reckoned as from point to point through the hill, instead of round the base or over the top?

E. H. O.

SILENT LIGHTNING.

[1003]—I was once witness of a very exceptional case of silent lightning during the day. Many years ago I was visiting a friend at the village of C——, in this neighbourhood, and distant from the large town of D—— some ten or eleven miles, and which can be seen in ordinary weather clearly from C——. About six p.m. on this summer evening, while the landscape in the neighboorhood of C—— was bathed in sunshine, I happened to look towards D——, and saw a very black cloud enveloping it. In the face of this cloud I distinctly saw repeated tongues of spiral-like flames, rising as if from the ground, but I heard no sound. The display was very magnificent, the bright flashes showing very well on the background of the dark cloud.

Next day the papers recorded that a violent thunderstorm had taken place at D——, on the evening of the previous day. From this I would conclude that while the *intensity* of light waves is not diminished by distance, that of sound waves becomes, within a short distance, wholly inappreciable by human ears. SENEX.

LUMINOSITY OF PLANTS AND ANIMALS.

[1004]—One evening some years ago, when staying near the village of Shepperton, in Middlesex, a friend asked me to come out to look at some kind of worm, which was giving light in the road. It proved to be a centipede, like that described in KNOWLEDGE, No. 104, p. 263, which is, I believe, called *Scolopendra electrica*, and left on the ground over which it was crawling a slightly luminous trail for some distance behind it.

On another occasion, when walking on cultivated sandy soil near the seashore, I found that a number of bright spots appeared on the ground wherever my feet had been in contact with it. It being too dark to see what produced this luminous appearance, I carefully removed some of the soil in which were these bright spots, and on washing it afterwards, found it contained a few small earth worms, which, when gently touched or pressed, emitted light in the dark.

The following short extracts from Phipson's interesting little book, "Familiar Letters on Some Mysteries of Nature," will, I have no doubt, interest many of your readers:—

"In 1762, Elizabeth Christine Linné, daughter of the celebrated Swedish naturalist, discovered that certain flowers emit light just after sunset."

"The plants which have been found conspicuous in this respect are the nasturtium, the sunflower, various garden marigolds, more especially the double ones, the two species of tagetes or Rose de l'Inde and Œillet d'Inde, the yellow lily (*Lilium bulbiferum*), and the tuberose."

"The phenomenon is seen in July or August after fine, dry weather, and soon after eight in the evening."

"It only occurs in dry weather, and is visible for about half-an-hour after sunset. After a rainy day, or when the air is damp, it never occurs."

"Professor Fries observed the phenomenon on a group of poppies (*Papaver orientale*), three or four flowers of which emitted little flashes of light."

"The light of these plants does not appear to be referable directly to the production of electricity, but more probably to a peculiar principle, that I have termed Noctilucine, which is produced by luminous animals."

"The common earthworm in October, and the *Scolopendra electrica*, or luminous centipede, in September, are often seen in a highly luminous state in this climate."

"In all these luminous animals, the researches of Ehrenberg and many other distinguished naturalists have shown the existence of certain organs specially adapted for the production of light."

"In luminous animals, these organs produce the substance which I have called noctilucine. It is a fluid nitrogenous substance, very easily decomposed, and which shines in the dark by oxidization, just like phosphorus itself."

"Whether it is taken from the glowworm, the scolopendra, or any other luminous animal, it shows the same chemical properties and the same spectrum (from E to F)."

"By luminous insects it is secreted as fast as required by nature

and as the organ by which it is elaborated is under the influence of the nervous system, these insects have the power of increasing or diminishing their light." E. C. R.

[1005]—Your correspondent, Mr. Vos, in this week's KNOWLEDGE has pictured just such an animal as was brought a few months ago by the grocer's boy in a box containing eggs, which were packed in straw. Its glowing appearance in the straw attracted attention, and it was thought to be a glowworm. On turning up the light, however, and examining it with a magnifying glass, I found it to be a kind of centipede. Putting out the light did not restore its luminosity; it appeared to have the power of emitting or withholding its light at pleasure.

Your answer to "Harry" reminds me that the self-same question was set at an examination of pupil-teachers a few months since, and, I believe, floored the greater part if not all of them. As you say, seven is not near the answer. One is apt at the first glance to overlook the fact that trains are already on the same line of rails as the train in which the "counter" starts besides those running on the return line, so that both sets will have to be met. W. W. S.

[1006]—It is a well-known fact that one or two British centipedes are luminous. The Rev. Leonard Jenyns, says in his "Observations in Natural History," p. 296:—

"Dec. 10, 1843.—A man brought me to-day what he called two glowworms, which he had seen shining on a bank the preceding evening. They proved to be only the electric centipede (*Scolopendra electrica*), which is frequent in the autumnal months in this neighbourhood (Swaffham Bulbeck, Cambridgeshire), and may often be seen shining by roadsides, more especially on mild damp evenings. They are constantly mistaken for glowworms by the common people. These two individuals I kept alive in a small box with damp earth at the bottom for several months; but I never observed them to shine once after they were taken.

"The luminosity of this insect is remarkable for diffusing itself over the ground, or the fingers of those who attempt to handle the individual from which it emanates, in like manner as when pure phosphorus is handled. I am not aware that this is ever the case with the real glow-worm." And he adds the following note: I was not then aware of the observations of Mr. Gosse, who states that he found the light might be immediately reproduced by breathing upon the centipede; the experiment fails (it is said) if repeated too often at once, though after the lapse of a day and night it will produce the same results as at first." CYPHEL.

[1007]—There is a luminous centipede, not at all uncommon; I have seen it several times.

About ten days ago, when walking in my garden in the evening, I observed something shining, and supposed it to be a centipede; but on examining it with a light, I found it to be a part of the dead body of a snail; and the night before last, on noticing a similar light, I discovered it to be a part of the body of a dead worm. I should think it was something of the latter kind that Mr. Fenton saw. The light in these cases would doubtless be caused by chemical change. J. DYER.

DISCOVERY OF AMERICA.

East Berar.

[1008]—Quatrefages, in his book "The Human Species," Chap. XVIII., on Migrations in America, writes:—"In 986, Bjarn Meriulfson, when on his way to Greenland, was carried by a storm as far as New England. In 1000, Leif, the son of Erick the Red, started for the country discovered by Bjarn. Accompanied by thirty-five men, he ran down as far as Rhode Island, where he found the vine, and gave the name of Vin-land to the country, which he took possession; he built Leifsbudir, passed the winter there, and noticed that the shortest day began at half-past seven and ended at half-past four. This observation, which agrees with all the other details, places Leifsbudir near the present town of Providence, 41° 21′ 10″, N. lat. . . . . The colonies founded in Greenland by Erick . . . . multiplied rapidly; both the east and west coast were peopled. Then two centres bore the name of Osterbygd and Vesterbygd . . . . as early as 1121, an Irishman, Erick Upsi, was created Bishop of Greenland, and had eighteen successors. Vinland was in the jurisdiction of this diocese. The tithes of this country figured among the revenues of the Church in the fourteenth century, and were paid in kind. . . . In 1418 it still paid to the Holy See as tithes and Peter's pence 3,600 lb. of walrus tusks. . . . Shortly afterwards fleets of pirates, springing from some unknown quarter, came down upon and pillaged them; the temperature of both land and sea gradually fell; voyages became more and more difficult, and, at last, ceased altogether."

In comparatively bookless India I have no resource but to ask you, is all the above true? Columbus discovered America in 1492, as if previously unknown, yet only 74 years before Vin-land paid tribute to the Pope, and all knowledge of the fact seems to have been forgotten. It would also be curious to find out the unknown quarter the pirates came from. Is it authenticated? As also is the fall in temperature, which seems extraordinary? If in 1418 there was a Bishop with Rhode Island in his diocese, can Columbus be said to have discovered America at all?. EDM. B.

THREE TIMES GREATER THAN.

[1009]—My attention was lately drawn to an opinion expressed by a learned judge upon the meaning of a not uncommon phrase, occurring in a certain Statute, namely, "three times greater than," which phrase his lordship held to be synonymous with the expression "three times as great."

Counsel argued that if (as was the opinion of the judge) 4½ was three times greater than 1½, then 3 would be two times greater than 1½, and 1½ would be one time greater (!) than 1½; but he failed to convince the judge. The same argument, if inverted, seems ever more forcible; for instance, granted that "¼ (or, indeed, any fraction) greater," would represent an increase of size over the object compared with, then "one time greater" must mean double the size, "two greater" treble the size and so on.

The case referred to is to be found in No. 22, "Justice of the Peace," p. 431. A. ROGERS WOOD.

CONTRACTED MULTIPLICATION.

[1010]—

71·380164 × 2·7354
2·7354

214140492 = product by 300
1927264428 = 3 × 9 = 27000
3854528856 = 2 × 27 = 54

195·2533006056

27·14986 + 92·41035
Reverse the multipliers.
27·14986
5301429

24434874
542997
108599
2715
81
14

2508·9280

[Viz., circ. 50 digits against 74 digits in a short sum.] First shown to me by Prof. Steggal, of the New University College, Dundee. Did Prof. Henrici mean this? (From "Young's Arithmetic.")

By the way, have you noticed how much one wants a comma, aye, and a red one, in the second Collect at evening prayer: that *both*, our hearts, &c., &c.? FACIEBAT.

DOUBLING OF POPULATION, CAPITAL, &c.

[1011]—$\frac{70}{r}$ is a simpler (though less close) approximation to the value of n than the formula $\frac{208+r}{3r}$ given at p. 262 [972].

The difference between the values given by the two formulæ cannot exceed ½, and is 0 when r is 2. G. O. E.

OBSCURE CAUSES OF DEATH BY DROWNING.

[1012]—It has often happened to me (as to all swimmers, I suppose) to swallow a mouthful of salt water, in spite of every care not to do so. I have also often been near swallowing some small object—a bit of cork or wood, a *blob* of bladder-wrack, &c. Now, it might happen that such a thing wedged itself in the windpipe, producing suffocation. The doctors finding that the cause of death, would never think of cutting open the throat in search of the cause, supposing the water sufficient. But may not some such accident account for the many cases where good swimmers have perished without any exhaustion to account for it? It might be prudent to wear a net tied over the mouth. Also lives might be saved if men when swimming far had a small flask of brandy round

XUM

the neck. Sudden failure of the heart's action could then be met by a pull at the stimulant, which is also an antidote to cramp.
HALLYARDS.

[A mouthful of salt water, catching in the throat—*i.e.*, not swallowed but taken in in breathing—may cause even the best swimmer some trouble. Last summer bathing from a boat, and happening to speak at the wrong moment to the boatman, I was caught that way—and if he had not happened to look my way, I might have been drowned close by him. For I could not call out, nor breathe except by gasps—which would not have done in the water. Fortunately he saw my signals of distress, and shoving an oar under me, gave me a chance of gasping my breath back.—R. P.]

STORM-GLASS.

[1013]—If of any use to your correspondents, the following recipe for a "storm-glass" is extremely simple and reliable.

Take a wide-mouthed glass bottle (say about five inches high), fill it with water till within an inch of the neck, or three parts full; then take a small empty oil-flask, turn it upside down, and insert it in the mouth of the glass bottle, filling the interstice with a piece of cork so as to be air-tight; the neck of the flask will then be under the water, which will rise or sink in it with the pressure of atmosphere, as in an ordinary barometer. E. BROWN.

SETTING UP CHESSMEN.

[1014]—Recently in conversation the question arose whether it was probable that, at the commencement of a game of chess, *all* the pieces were ever before on exactly the same squares? One or two thought it not unlikely. Now, without reversing the board, the White Pawns may be arranged in $\lfloor 8$, that is, 40,320 different ways. For each one of these positions, the Black Pawns can also be arranged in 40,320 ways. Thus there are $40{,}320^2$ or 1,625,702,400 ways of arranging the Pawns. Again the superior pieces may be arranged in 64 different ways. Finally, the board can be reversed. Thus there are in all $(\lfloor 8)^2 \times 64 \times 2 = 208{,}089{,}907{,}200$ different ways in which these mimic forces may be put on the board in order of battle.

Suppose we play 100 games each day, it would thus take any one more than five million years to exhaust all these possible positions.

Judge, then, how little an affirmative answer to the original question is likely to be true. D. M.

SOFTENING WATER.

[1015]—Letter 954, signed "Lewis James," asks for information as to the process by the Atkins Apparatus mentioned in the Guide and Catalogue of the great International Fisheries Exhibition. Application at 62, Fleet-street, London, E.C., the offices of the Company, will procure him full particulars on the softening and purifying of water for all purposes and in any quantity for constant supply.

Allow me to add that the discovery of lime treatment to soften water was made by the late Dr. Clark about forty years ago, but then too costly to apply to waterworks. The Atkins mechanical process overcomes this and many other difficulties, thus rendering Dr. Clark's discovery of great value in the supply of softened water to every community at a very small cost, with an immense saving in every household. Dr. Clark's discovery is now public property, and the application of it depends entirely on the inventor of economical machinery for its universal adoption. For years I have been interested in the treatment of water, and I do not hesitate to state that the Atkins Apparatus is the most simple I have seen, and in this opinion I am not alone. C. E. PARKER-RHODES.

Oct. 18, 1883.

LETTERS RECEIVED AND SHORT ANSWERS.

JOHN SIMPKIN. You will see that I am very much with you about imaginary mathematics.—AN ADMIRING READER. Is it ungrammatical to say, "I have done with you"? And if not, is it wrong to say, "This is done with?" I do not say it is not; but the expression is familiar.—JULES MAGNY. 1. No. I have not yet published an article showing how the year may have first been measured by the seasons. 2. The gnomon was used in the way you indicate, that is by observing shadow lengths. This was done probably much earlier than 1100 B.C. 3. Do not know enough about cells and their action to answer this question, though the fact is as you say. 4. Articles on the different systems of drawing geographical maps would be very much in my line, and (if readers interested) may probably soon be given.—F. BATTERSBY. Thanks; it seems clear beech nuts have often kernels.—C. T. BUDENBERG. Would indeed that everything printed were true! Have as you see used that startling Tit-bit.—W. B. S. That theory about sun spots is not strictly new. It was first suggested by Scheiner in 1611, and the bodies supposed to travel round the sun were called Bourbonian Stars.—J. W. DAWSON. Have not the book and cannot therefore tell you the publisher's name. It is I am told a capital work.—180° LONGITUDE. But, *lessening* west longitude means running east. Of course with the new way of reckoning longitude adopted by the Geodetic folk your difficulty would not exist.—B. WALKER. If any feel animosity or rancour about such matters it is a pity, but really need not much interest "us." Why should the truthful tone of the articles you mention need counterbalancing?—PLYMOUTH HOSPITAL. Can you conceive of no other mode of genesis than that first sketched in the nebular hypothesis? Now *I* can. That mode of genesis seems to me contradicted by numerous facts chiefly learned since Laplace's time.—AN ENQUIRER. Many known cases of seeming identity of thoughts in persons at a distance; but it seems most probable they are cases of coincidence. Mr. Labouchere would say, Certainly they are so, because he knows all about thought. But there are more things in heaven and earth than are known or even guessed in *his* philosophy.—THOS. COWLDESTH (or COWHERTY, or CONLOERTHZ, or COWTOESTHS? ? ?) No; have discovered no such correction; but would willingly hand you a cheque for a considerable amount (any you please) if you could in less than five minutes or in over five million, solve the fifteen puzzle *as propounded*,—viz., having the numbers 1, 2, 3, 4 in that order on first line, 5, 6, 7, 8 on next line, 9, 10, 11, 12, on third line, 13, 15, 14 on the fourth line, bring them by fair shifting without lifting, so that the same numbers are in the same places in the first three lines, but the numbers 13, 14, 15 *in that order* on the fourth line. It is the easiest thing in the world to get the numbers in regular rotation, from any order they may be set in, but to get them arranged in their proper places according to the actual conditions of the problem is impossible outside of the imaginary universe we have recently heard so much about. The Thirty-four Puzzle is simplicity itself: the difficulty is to miss the solution.—JAS. MCKEAN. Do not know anything about the matter myself, or would tell you.—J. F. MOULT. Thanks; but fear our readers would not be grateful for your new proof that a man may be his own grandfather. Of course if father and son marry respectively daughter and mother, the son, being step-father of his father's wife, is his father's step-father-in-law, or his own step-grandfather-in-law. If you enjoy puzzles of this sort, wander into the following maze, and see what comes of it:—John Smith a foolish young fellow of seventeen falls in love with, and marries, Mrs. Brown a fair widow of fifty, who having married at sixteen has a daughter of thirty-three, who also marrying young (it ran in the family you see) has a daughter of sixteen, Miss Robinson. Thomas Smith, John's grandfather, a lively youth of fifty-five summers, smitten by Miss Robinson's charms, marries her, while James Smith, Thomas's son and John's father, marries the charming Mrs. Robinson. Consider the various relationships among these folk. And if you remain outside Colney Hatch, let a few brothers and sisters of Thomas, James, and John, intermarry *ad lib.* with sisters and brothers of Mesdames Brown, Robinson, and J. Smith, *née* Robinson. Then consider their relationships and those of children born to these various couples. Make your will first, as it might be disputed if made later.—GARETH. I know little about the *modus operandi* of mesmerists; and think I would rather not have the subject dealt with in these pages. Though I know many of the phenemena to be real enough, they have been associated with so much humbug that they do not form an inviting subject. The most satisfactory experiments in beginning are those made on animals, especially pigeons, which are very susceptible to hypnotic treatment.—M. H. CLOSE. Thanks. I was, however, aware of the pronunciation of the word *maise*, which, as I said, to an uncritical ear is something like that of the word "masher." As you say the fact that the word *maise* means also "an ornament," and "food," is another very strong argument against the absurd derivation of "masher" from "maise."—ALEXANDER CROSS. Thanks; the duke's lecture amusing truly. Fancy the general flood leaving its neat but unique mark in Wales!—CHEESE CONSUMER. The *origin* of cheese mites! Do we know the origin of anything? The Natural History of cheese mites *might* be managed.—G. B. R. BOUSFIELD. Smyth's *Cycle* gives a number of those names. So do some old globes. I may shortly give a weekly list of them in these columns. W. HOLMES.—Is the word *Agnostic* so unfamiliar? It is given in the supplement to Webster's Dictionary. The word *Gnostic* means one who claims to know, while the word *Agnostic* means one who admits that he does not know. Usually the matter referred to as known or not known is the nature of Deity. You will find that there were Gnostics and Agnostics in very ancient times. I am inclined to think that Zophar who said "Can'st thou by searching find out God," and Elihu who said "The Almighty, we cannot find him out," were Agnostics.

UNCERTAIN. No, sir; I deny utterly the aptitude of your illustration. You cannot divide the world into the two classes you represent by the bitterly-weeping upbraiding multitude and the non-starving folk at their dinner-table. We are *all* of the multitude. "Every soul that cometh into the world" has to deal with the great problem for himself, even if only in deciding that he will accept the judgment of others about its solution. I am not prepared to admit that indifferentism arises generally or often from engrossment in lower pursuits. I should say it arose in ninety-nine cases out of a hundred from the conviction that only misery to self and others can arise from care about phantasms. Then, what *are* lower pursuits? I expect you mean such pursuits as ninety-nine out of a hundred must engage in if they are to live. I might in your own tone answer, what God has thus given to men to do is but idly condemned as low; what His will has sanctified "that call not thou common or unclean." But why ask me what I think? In what way has the great problem come before me otherwise than it has come before every one living now and in the past or to live hereafter? Men come to me and say, what do you think in these matters? I answer what matters it to you what I think? What right have you to ask? I do not seek to know what *you* think. Then comes the answer, Oh, but you should want to know; such indifference is selfish; and though we do not, for the moment, say what *we* think, we are not selfishly indifferent like you: tell us your views. If, thus urged, I answer I think so and so, immediately ninety-nine out of a hundred say That's not the way *we* think; you ought to think thus and thus; and if you don't think thus and thus, you ought to hold your tongue, or else [and this I take it is what most of the inquisitive sort desire] you should solemnly assert that you hold the particular views which we, Messrs. Meddlesome, Pry, and Puzzlewit, consider to be right. When there comes along a plain and honest teacher who says, Amidst much that is perplexing I see one clear line of duty; strive in every way to make yourself and all around you as happy (both by increasing their pleasures and diminishing their sorrows) as you possibly can, and make your success the measure of the rightness of your life-conduct, then because there is no phantom-hunting *here*, the whole fry of phantom-hunters accuse him—of all men—of indifference.

Our Whist Column.

By "Five of Clubs."

A WHIST STUDY.

ON consideration, instead of giving this week the Whist game referred to in our last, we prefer to give the position at the end of the eighth round, in order that our Whist readers may have an opportunity of studying how the hand should have been played by *Z* to save and win the game, and may further appreciate the beauty of the combination which enabled *A* and *B*, taking advantage of the opening left them by *Z*, to save an apparently lost game.

The cards lay as follows:—

Y held.	*B* held.
Diamonds.—K, 9, 7.	*Diamonds*.—A, 10, 8, 3.
Club.—8.	Club.—5.
Heart.—Kn.	
A held.	*Z* held.
Diamonds.—4, 2.	Hearts.—7, 6, 5, 3.
Clubs.—Kn., 10, 7.	Spade.—Kn.

It was *Z*'s lead, and *A* and *B* must make every trick to win and save the game. *A* the original leader had shown by leading the penultimate that he held five Clubs, of which three remain in his hand. This is known to the whole table. *B* had signalled for trumps, and from the play it is clear that he now holds four trumps one honour. Moreover this honour must be the Ace or the game is lost. *A* further knows that his partner holds trump Three. *Z* knows from the play that *A* holds both Four and Two of trumps. He also knows that the Knave of Hearts is with his partner, and that *Y* holds a Club which if the winning Club insures the game. The game is also sure if *Y* holds the King and Ten of trumps.

1. How is *Z* to play to make sure of winning, if *Y* play correctly, even though *Y* shall be found to hold a losing Club, but with either King or Nine, or Ten Nine of trumps besides a small one?

2. *Z* actually led a Heart; how can *A* and *B* now save and win the game?

Our Chess Column.

By Mephisto.

SUI-MATE PROBLEM, No. 103, BY E. N. FRANKENSTEIN, p. 281.

POSITION:

White.—K, QKt2. Q, QBsq. R's, K2 & KR6. B, QRsq. Kt's, Q4 & QKt6. P's, QKt3 & QR5.
Black.—K, QB4. Q, QR3. B, KR6. P's, QKt5, QB5 & Q4.

SOLUTION.

1. Kt to R4 (ch)	1. K takes Kt
2. K to B2 (ch)	2. P to B6
3. R to R4 (ch)	3. B to Kt5
4. Q to Q2 (ch)	4. Q to Q6
5. K to Qsq!	5. Q takes Q (forced) mate

THE following interesting game was recently played in the Handicap Tournament now in progress at Purssell's Chess Room, at the odds of Pawn and move, between Mr. Heppell, third class, and Mr. Gunsberg, first class.

Remove Black's King's Bishop's Pawn.

White. Heppell.	Black. Gunsberg.	White. Heppell.	Black. Gunsberg.
1. P to K4	Kt to QB3 (*a*)	17. P to K4 (*p*)	P takes P
2. P to Q4 (*b*)	P to Q4 (*c*)	18. QKt to Q2 (*q*)	P to K6 (*r*)
3. P to K5	B to B4 (*d*)	19. Kt takes P	B to Q6
4. Kt to KB3	P to K3	20. Q to B2	B to R3
5. P to QR3 (*e*)	KKt to K2	21. B takes Kt (*s*)	P takes B
6. Kt to R4 (*f*)	B to K5 (*g*)	22. Kt to Kt2	KR to B sq
7. B to KKt5	P to KR3 (*h*)	23. Kt to B4	R takes Kt (*t*)
8. B to K3 (*i*)	P to KKt4 (*j*)	24. P takes R	R to B sq (*u*)
9. Kt to KB3	Kt to B4	25. KR to B sq (*v*)	R takes P
10. P to B3 (*k*)	P to Kt5	26. Q takes R	B takes Q
11. KKt to Q2	Kt takes B	27. R takes B	Q to R3 (*w*)
12. P takes Kt	B to KB4 (*l*)	28. R to B sq (*x*)	Q to K6 (ch)
13. P to Kt3	Q to Kt4	29. K to Q sq	B to K7 (ch) (*y*)
14. Q to K2	P to KR4	30. K to B2	Q to Q6 (ch)
15. B to Kt2	Castles (*m*)	Resigns (*z*)	
16. Kt to B sq (*n*)	Q to Kt3 (*o*)		

NOTES.

(*a*) We think this one of the most reliable defensive moves at Black's command.

(*b*) As it obviously is Black's intention to play P to Q4, White might play 2. QKt to B3. We fancy that a simpler game would be the result. If then Black replied with 2. P to K4, White could play 3. P to B4 with good effect.

(*c*) Better than 2. P to K4, although the latter move will, if not properly met by White, result in an attacking game for Black. In reply to 2. P to K4, White ought to play either 3. P to Q5, followed by 4. P to KB4, or perhaps better still 3. Kt to KB3.

(*d*) It is important to release the QB before playing P to K3.

(*e*) This move gives Black time for development. It would have been better to oppose Bishops at Q3.

(*f*) Again loss of time. Steinitz said you should never without good reason move a piece twice early in the game.

(*g*) The B was not to be denied. B to K5 is a move of considerable power, to which White had no satisfactory reply. The combinations based upon this move are interesting. If, for instance, 7. Kt to QB3, Kt takes QP. 8. Q takes Kt, Kt to B3, recovering the piece *plus* a Pawn next move by Q takes Kt. Or, if 7. P to KB3, Black could play the quiet move of Kt to B4, which would leave him with a good position. He could not venture upon the bold but tempting course of sacrificing a piece, as White by proper play would remain with the best game, *i.e.*, 7. P to KB3, B takes QBP. 8. Q takes B, Kt takes QP. 9. Q to R4 (ch) (best), KKt to B3. 10. P to KKt3, P to KKt4. 11. B to K3 (best), B to B4. 12. B to QKt5, and White wins.

(*h*) This move further improves Black's game. No good would result from the check with the Queen, *i.e.*, 8. Q to R5 (ch), K to Q2, and White must either lose a Pawn or give up two pieces for the Rook and another Pawn (which would be preferable) by playing 9. P to QB3, P takes B. 10. Q takes R, P takes Kt. 11. Q takes P, &c.

(*i*) 8. B takes Kt, B takes B. 9. Kt to KB3, B takes Kt. 10. P takes B, would have been more favourable to White than B to K3.

(*j*) Taking a forcible advantage of the position.

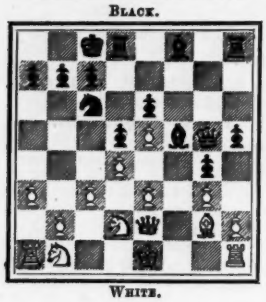
(*k*) 10. Kt to QB3 would have been a stronger move.

(*l*) If, instead, Q to R5 (ch). 13. P to Kt3, Q to Kt4. 14. Kt takes B, Q takes KP (ch). 15. Q to K2, Black would lose all his

advantage, he being compelled to play Q takes Kt, upon which an exchange of Queens would follow.

Position after Black's 15th move.

BLACK.



WHITE.

(*m*) White threatens to free his position by playing P to K4, in which case Black need not take the P, but would retire B to Kt3, and the position would remain unaltered. It would have been different had Black, instead of castling, played the likely-looking move of B to R3, for then would follow 16. P to K4, P takes P. 17. Kt takes P, B takes Kt. 18. B takes B, with the better game, as the check with Q on B8 is useless on account of K to B2, &c.

(*n*) With the object of bringing the QKt into play, then P to K4, &c., and with a view to castling QR. It would have been too risky to castle on the K side on account of P to R5, &c.

(*o*) Threatening the Knight, but in reality B to Q6.

(*p*) The best resourse; White could not allow B to Q6 to be played, which would have been followed by B to R3, R to B sq, &c.

(*q*) This looks good as it at once recovers the Pawn, but, as will be seen, appearances are often delusive. White would have done much better by playing Kt to K3 first. Undue haste is equally injudicious in defence as well as in attack.

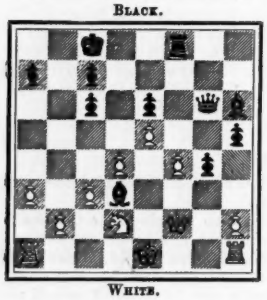
(*r*) The sacrifice of this Pawn maintains all the advantages of Black's position.

(*s*) Castling would have been the lesser evil.

(*t*) This sacrifice sustains the attack. B takes Kt would have won a P, but might have led to an even game.

Position after Black's 24th move.

BLACK.



WHITE.

(*u*) The position is now singularly interesting. If White plays 25. Castles, then follows B takes P. 26. P to Kt4, B to Kt8, and mates in two moves. Or, if 25. Q to Kt2, R takes P. 26. Q takes BP, B to K5. To avoid the loss of the R, White must play 27. Kt takes B, after which Black can force the game in the following manner:—R takes Kt (ch). 28. K to Q sq (best), R takes P (ch). 29. P takes R, Q to Q6 (ch). 30. K to K sq, B to Q7 (ch). 31. K to B2, B to K6 (ch). 32. K to Kt3, B to Kt4 (dis ch). 33. K to B2, B to R5 (ch). 34. K to Kt sq, Q to K6 (ch), and mates next move.

(*v*) In the hope that Black would lessen his attack by playing B takes R.

(*w*) The winning move. Black relied upon this move, as otherwise he need not have allowed White to exchange his Queen.

(*x*) There is nothing better to prevent the threatened mate by Q to (K6, K7 and K8 (ch).

(*y*) Moderation is advisable not only in attack and defence but also in victory, as it renders it more decisive. This is better than taking the Rook at once, as that would only win the exchange, while now Black wins a clear piece.

(*z*) Duration 2 hours 40 minutes.

ANSWERS TO CORRESPONDENTS.

*** *Please address Chess Editor.*

F. W. Markwick.—Problems received with thanks, and will receive due attention. A capture on first move is to be regarded less seriously in two moves than in Problems of a higher number of moves, provided always it does not make the solution too obvious.

S. B. B.—Hardly a week passes without somebody asks us the same question over again:—"Can you recommend me a book on the openings?" The only two good books we know of, and which we could honestly recommend, "Cook's Synopsis" and "Gossip's Theory," are out of print. Books like "Staunton" and "Wormald," which were good books in their time, are somewhat out of date now. Other books which are still in print were compiled by dishonest men—that is, persons who either for their own vain glory or profit—it does not matter which—produced a mass of worthless Chess literature to the disadvantage of the public, publishers, and abler workers—a proceeding which is constantly being supported by the Chess press, whose representatives really belong to the same snug family party. Until editors and publishers will replace these usurpers by honest and able workers, the public will not get satisfied, and Chess will not be raised to the proud position our noble game deserves to hold among our national pastimes. Compared with cricket and other sports it is comparatively little known. As you only wish to know the Vienna and French defence, we should recommend you—for want of anything better—to apply to the "British Chess Magazine" for any numbers that might contain analyses of these openings.

B. G. Laws.—Accept our best thanks for review, no space this week.

Rev. W. Anderson.—In problem 104, B to Kt. 3 does not even threaten a mate. Black could reply B to B2 or R2.

J. K. R.—If 1. P to K3, then P to K4; 2. K to Kt4, B to Q3, and you see there is no mate.

A Conrad Smart.—Your notation is, unfortunately, indistinct.

Berrow.—You have likewise been deluded by this ingenious composition, see reply to I. K. R.

M. T. Hooton.—Hesperus correctly solved. In No. 104, if Kt takes P, then K to Q4, and there is no mate. Problem 104 correctly solved by Clarence and Schachrath.

MR. R. A. PROCTOR'S COURSE OF LECTURES.

1. LIFE OF WORLDS.
2. THE SUN.
3. THE MOON.
4. THE PLANETS.
5. COMETS.
6. THE STAR DEPTHS.

See Advt. Pages for full Syllabus.

The following arrangements are complete: the numbers in brackets referring to above list.

Great Hall, Tunbridge Wells, Nov. 20, 22 (4, 5).
Concert Hall, Maidstone, Nov. 19, 21, 23 (1, 2, 3).
Stockton, Nov. 26 (1).
Edinburgh, Nov. 28 (6).
Rothesay, Nov. 29 (1)
Morningside, Dec. 4 (4).
Falkirk, Dec. 5 (6).
Alexandria, Dec. 6.
Altrincham, Dec. 10 and March 11.
Carlisle, Nov. 27, 30; Dec. 3, 7 (1, 2, 3, 4).
Perry Bar, Jan. 29 (6).
King's Heath, Jan. 30 (1).
Colston Hall, Bristol, Feb. 18, 21, 25, 28; March 3, 6 (the full course).
Assembly Rooms, Cheltenham, Feb. 5, 8, 12, 15 (1, 2, 4, 6). At 3 o'clock, Feb. 5 and 12 (3, 5).
Assembly Rooms, Bath. Four Morning Lectures at 3 o'clock, Feb. 6, 9, 13, 16 (1, 3, 4, 6); two Evening, Feb. 6, 13 (2, 5).
Birkenhead, March 10.

NOTE.—*All communications respecting Lectures should be addressed to Mr. John Stuart, Royal Concert Hall, St. Leonards.*

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